SE Tools Overview & Advanced Systems Engineering Lab (ASEL)

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

Pradeep Mendonza
TARDEC Systems Engineering Group
pradeep.mendonza@us.army.mil
June 2, 2011

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
02 JUN 2011	**N/A**	**-**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
SE Tools Overview & Advanced Systems Engineering Lab (ASEL)	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
Pradeep Mendonza	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)	8. PERFORMING ORGANIZATION REPORT NUMBER
US Army RDECOM-TARDEC 6501 E 11 Mile Rd Warren, MI 48397-5000, USA	**21880**
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
US Army RDECOM-TARDEC 6501 E 11 Mile Rd Warren, MI 48397-5000, USA	**TACOM/TARDEC/RDECOM**
	11. SPONSOR/MONITOR'S REPORT NUMBER(S) **21880**

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release, distribution unlimited

13. SUPPLEMENTARY NOTES
The original document contains color images.

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			
unclassified	**unclassified**	**unclassified**	**SAR**	**23**	

AGENDA

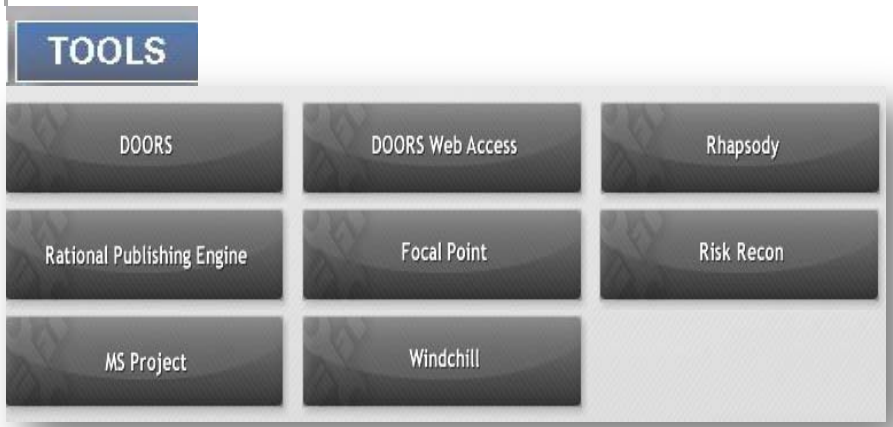
- Systems Engineering Capabilities
- Interactive Reference Guide (IRG)
- SEG COTS Tools
- What is ASEL?
- Snapshots of the Decision Management Tool

Systems Engineering Group (SEG) Mission and Vision

The U.S Army Tank Automotive Research, Development and Engineering Center (TARDEC) Systems Engineering Group's (SEG) mission is to provide full lifecycle systems engineering (SE) service, support, guidance and expertise for the Department of Defense (DOD) Ground Domain and to be the preferred provider of Systems Engineering through demonstrated capability

enabled by

SEG Capabilities



Interactive Reference Guide

The Systems Engineering processes are documented in the Interactive Reference Guide (IRG). The IRG is a process asset library that houses the knowledge and best practices on how to practice SE.

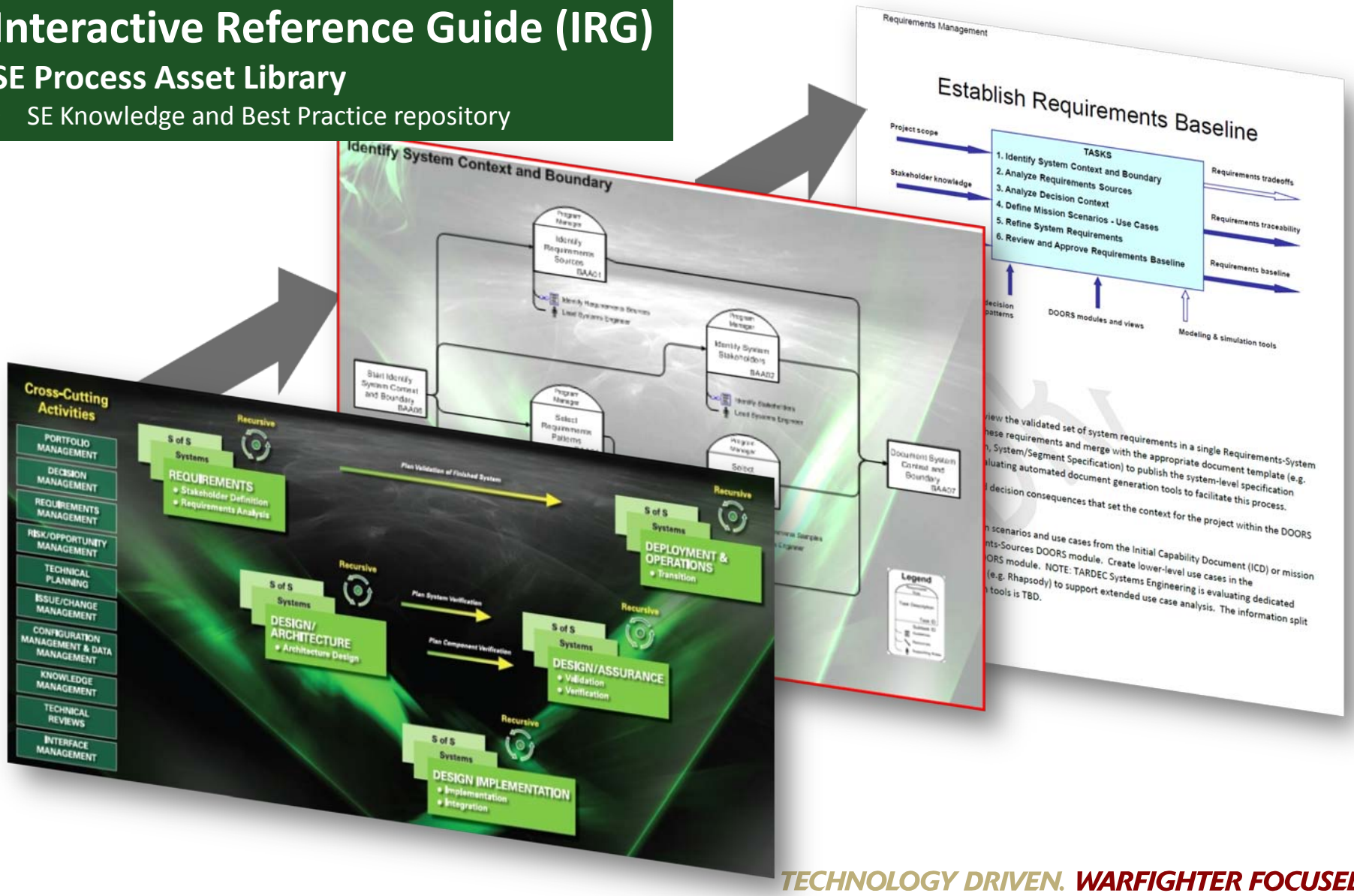
SEG Tools

- **Rational DOORS** (Requirements Management)
- **Rhapsody** (Model based System Engineering Tool)
- **Rational Publishing Engine** (Report Generator)
- **Risk Recon** (Risk Management)

Interactive Reference Guide (IRG)

SE Process Asset Library

- SE Knowledge and Best Practice repository



TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

IRG Framework

IRG Content

Process Inputs:

Project Scope: Project scope includes a clear statement of the problem to be solved.

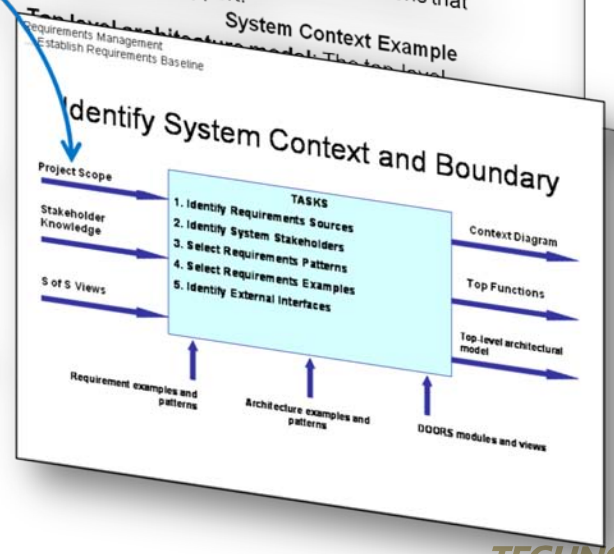
Stakeholder Knowledge: Stakeholders are source of requirements and contextual information that is essential to fully understand the problem to be solved and to formally define success.

Systems of Systems Views: System of Systems views include graphical views or tables that provide context by illuminating where the system fits into a System of Systems or how the system interacts with legacy systems.

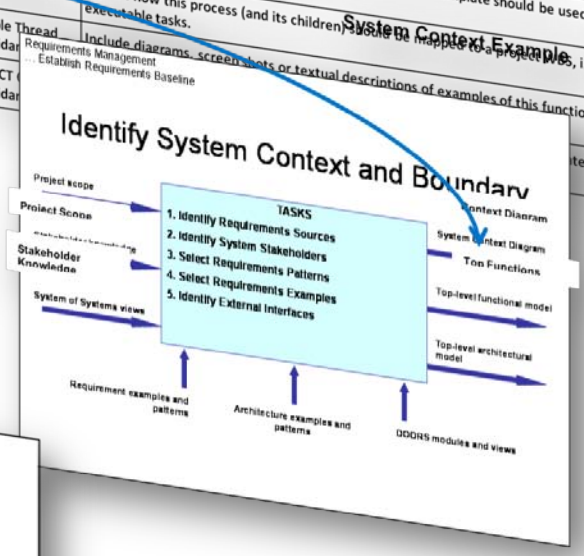
Process Outputs:

Context Diagram: At a minimum, a System Context Diagram identifies each interface with an external system. External interactions may be labeled by type: functional, control, data, mechanical, etc.
(example next page)

Top Functions: The top-level functional model of a system may be a simple 2 or 3 level hierarchical decomposition of the functions that a system must support.

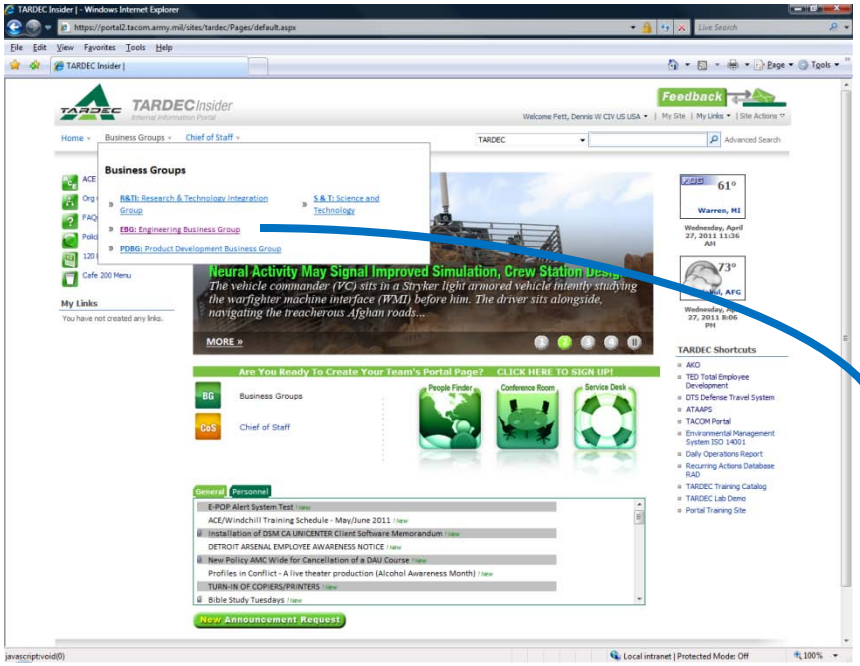


Process Guidance Type	IRG Process Content
Review Guidance	Explain how the outputs of this function will be used during a Technical Review event.
Role Guidance	Describe who in the organization (by role) is responsible for supporting this function.
Tool Guidance	Describe what SE tools, such as DOORS, are used to support this function.
Documentation Guidance	Describe how a knowledge pattern or document/report template should be used to support this function.
WBS Guidance	Explain how this process (and its children) should be mapped to a project WBS, i.e. translated into executable tasks.
Example Thread Guidance	Include diagrams, screenshots or textual descriptions of examples of this function being performed
TARGET/CT Guidance	...te to mapping this

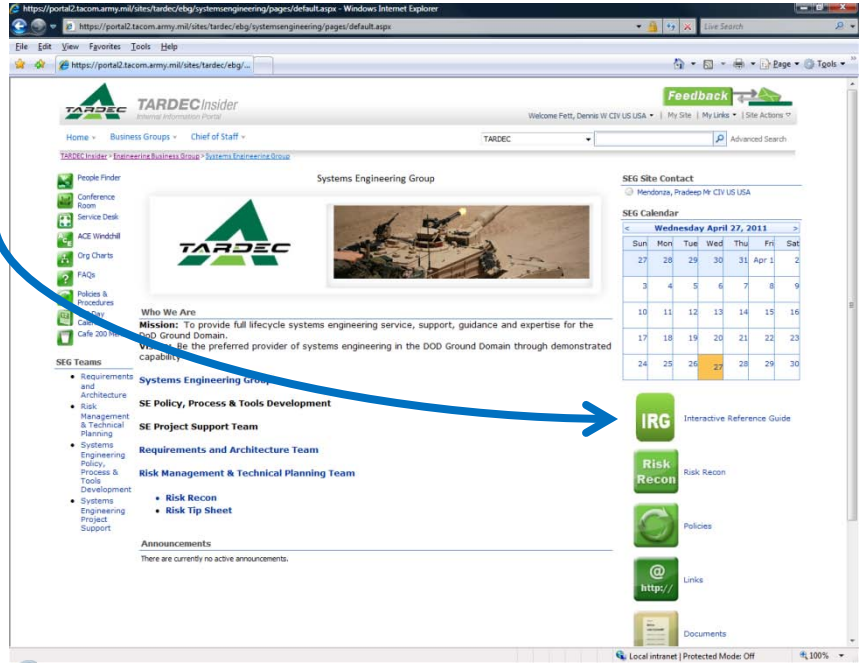


IRG Access

- **TARDEC Insider →EBG**



- **Systems Engineering Homepage**

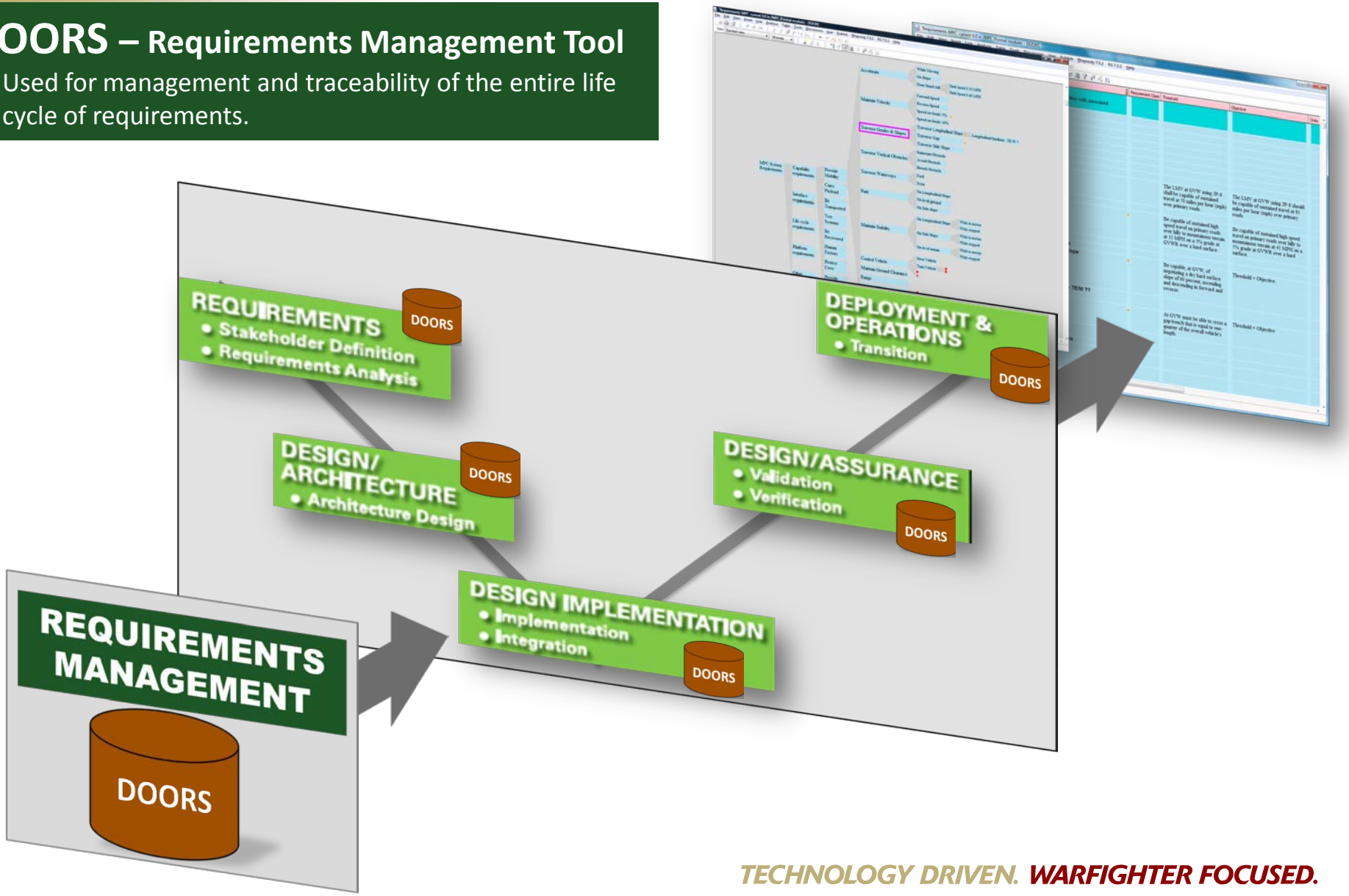


TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

Rational DOORS

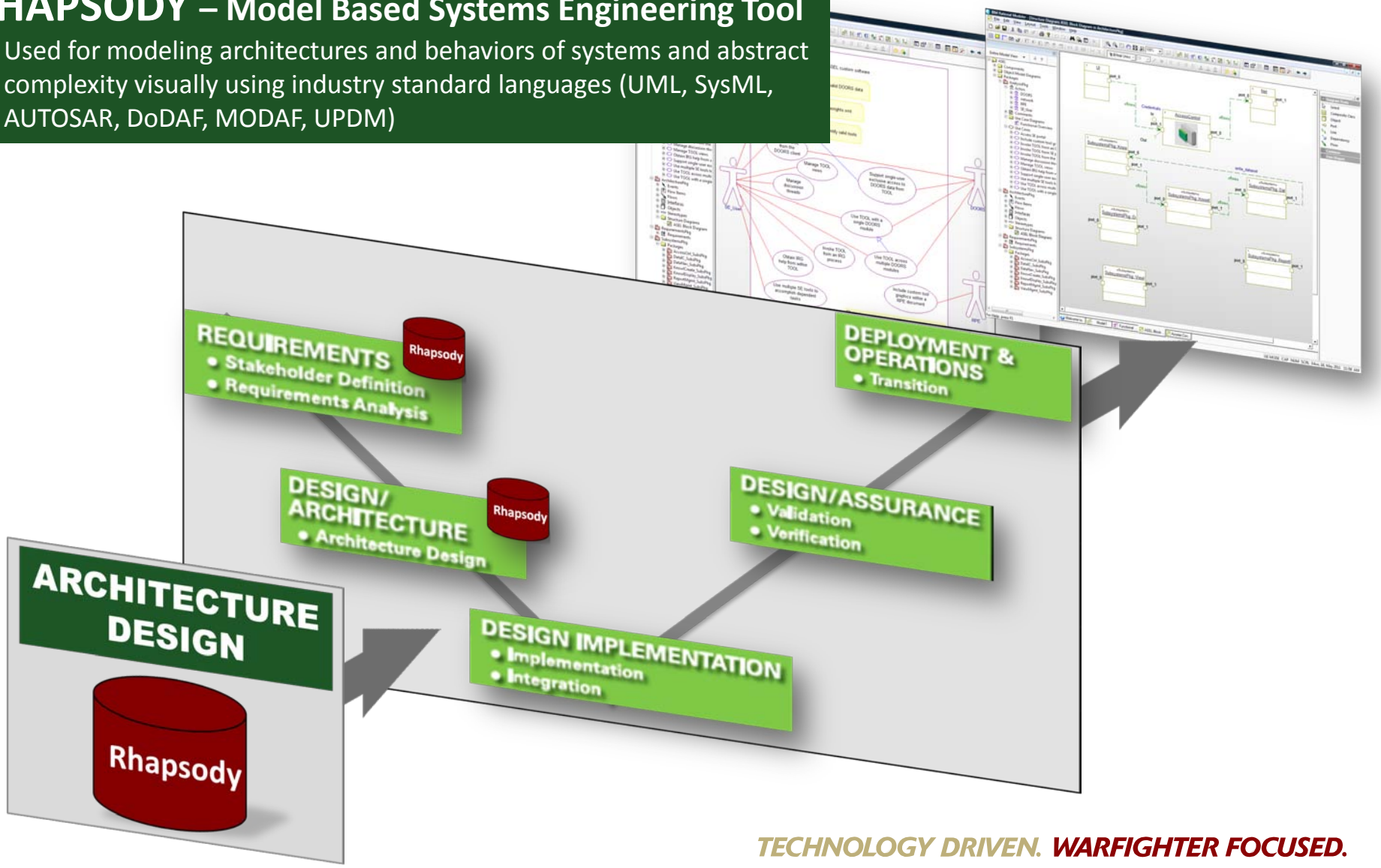
DOORS – Requirements Management Tool

- Used for management and traceability of the entire life cycle of requirements.



RHAPSODY – Model Based Systems Engineering Tool

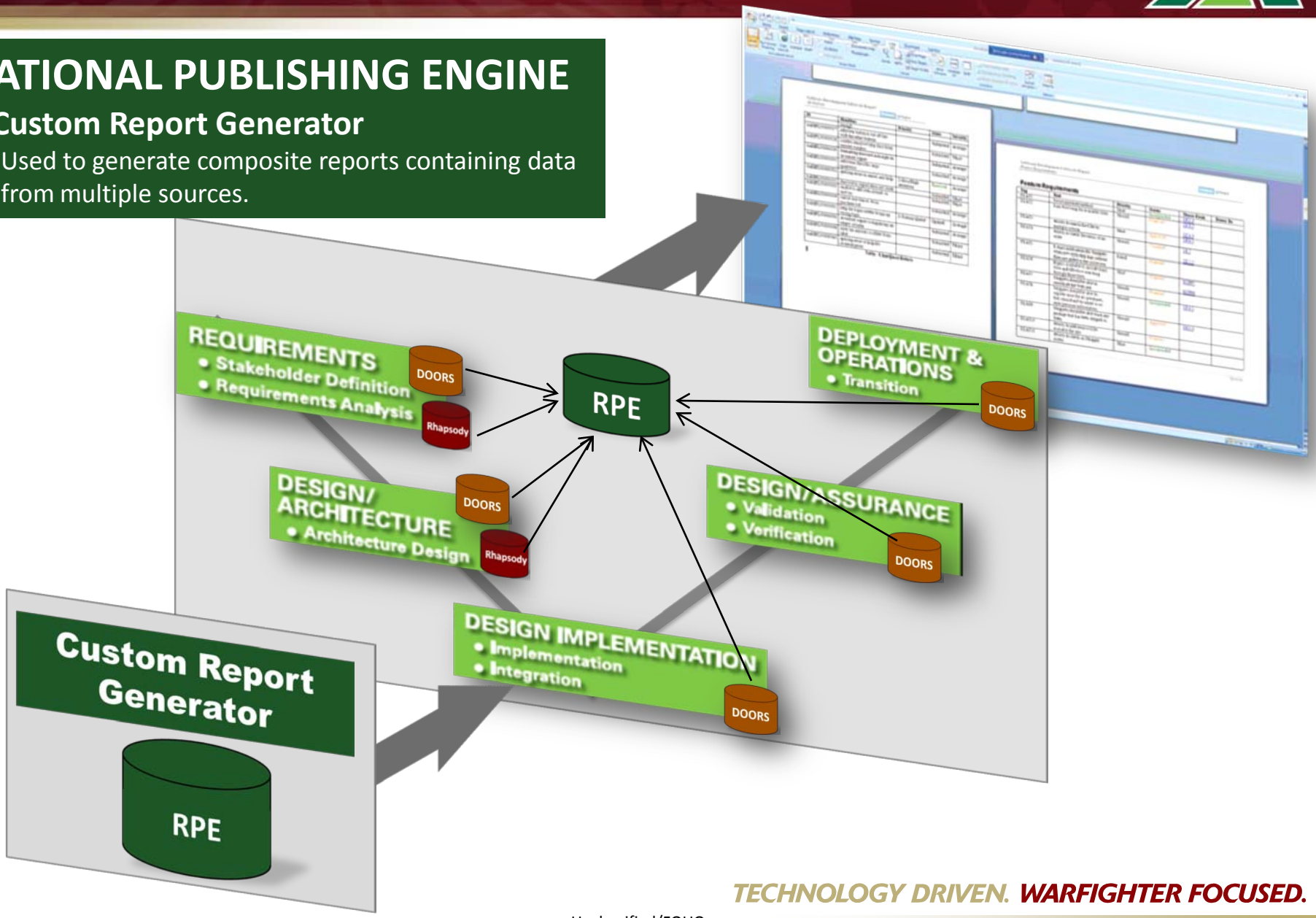
- Used for modeling architectures and behaviors of systems and abstract complexity visually using industry standard languages (UML, SysML, AUTOSAR, DoDAF, MODAF, UPDM)



RATIONAL PUBLISHING ENGINE

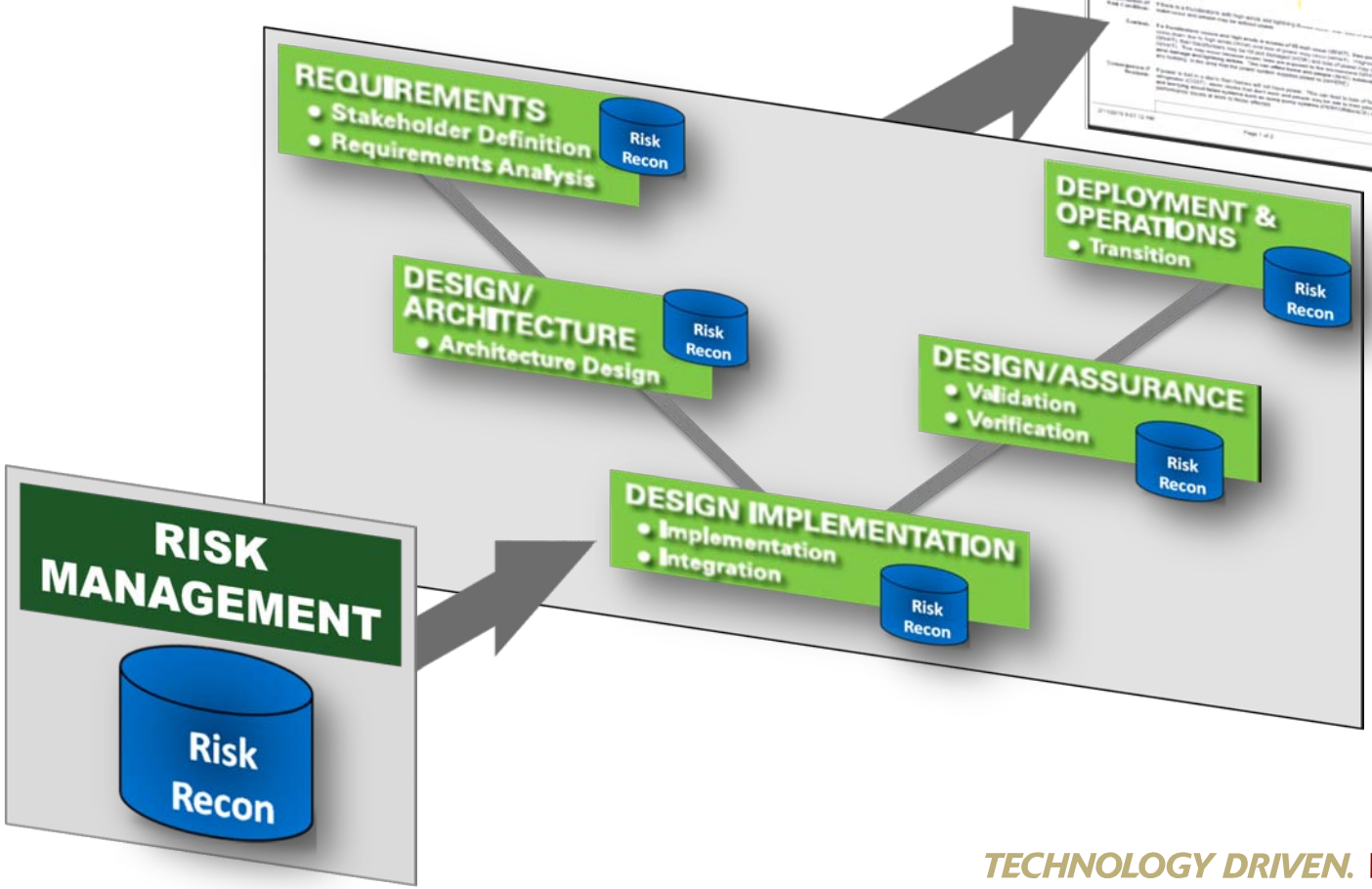
– Custom Report Generator

- Used to generate composite reports containing data from multiple sources.



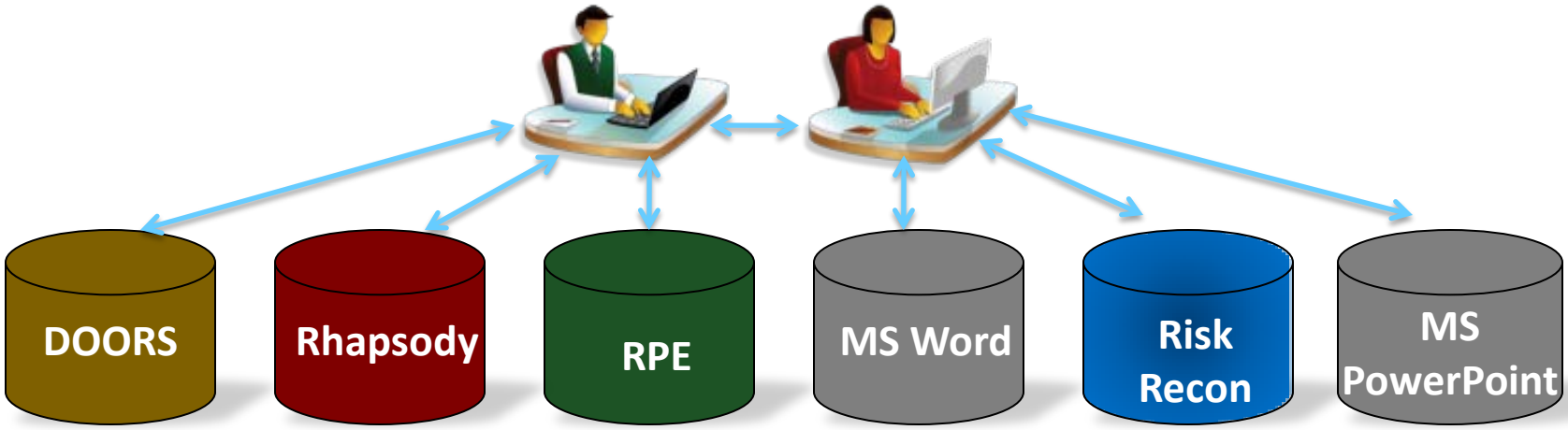
RISK RECON – Risk Tracking and Management Tool

- Enables standardized capture of risk data in a collaborative environment and management of captured risks.
- No Cost. Free for the DOD



TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

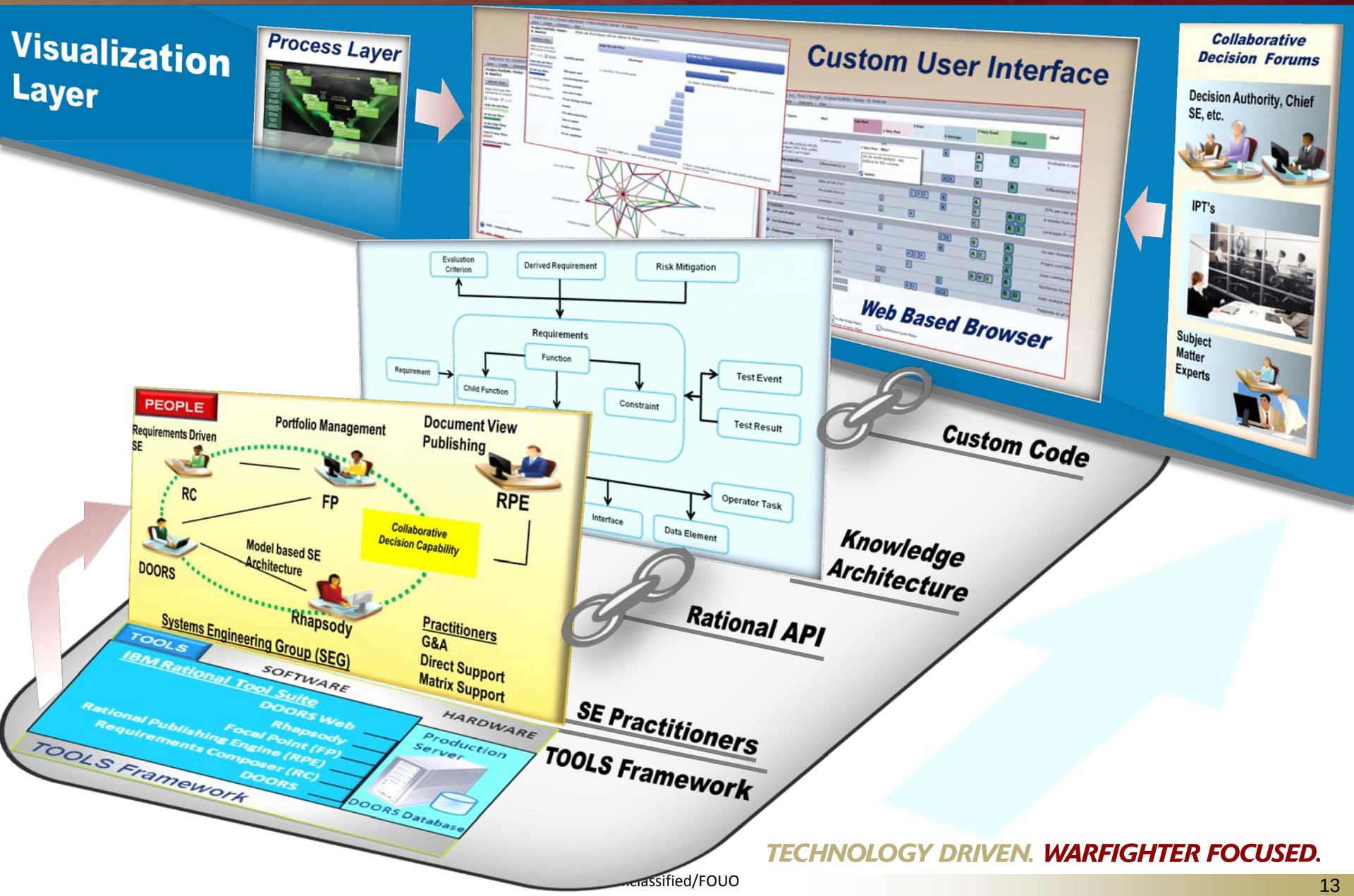
Gaps using COTS tools



Gaps with COTS Tools

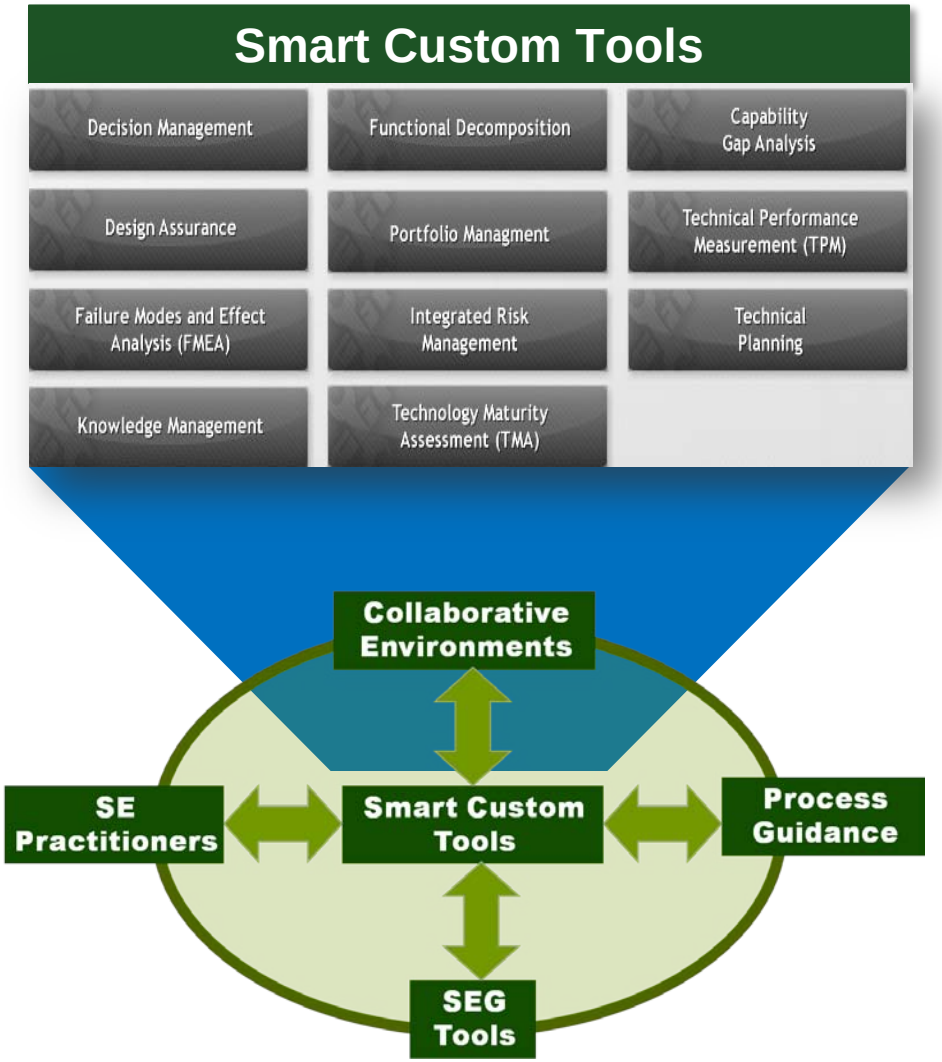
- Lacks Real Time Collaboration
- Silos of Information (Information loss)
- Lacks Continuous Traceability
- Dependent on Specialists
- Two Stage Process – Think and then Link

Smart Custom Tools Framework



TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

Smart Custom Tool Capabilities



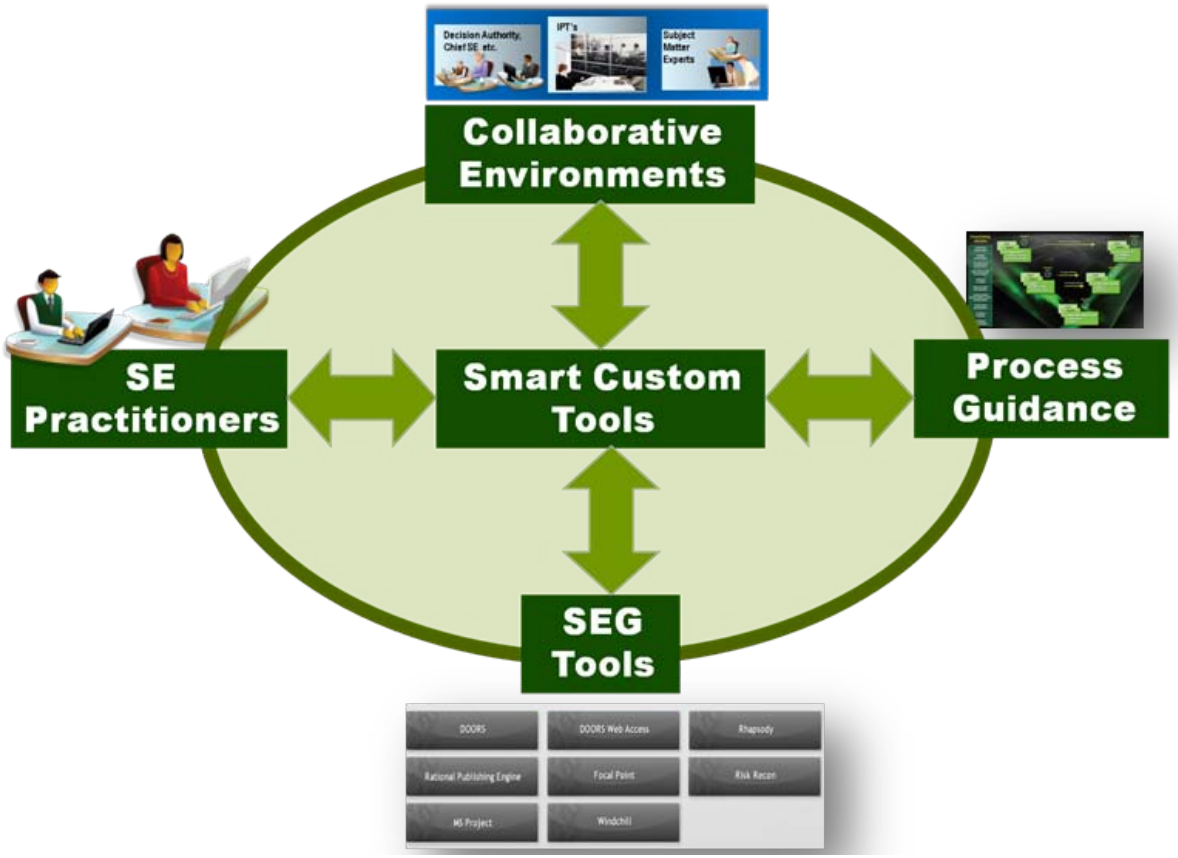
Smart Custom Tool Capabilities

- Leanest possible SE information model
- Integrated methods engine
- Simplify! - leanest possible toolset
- Automate publishing of documents & views
- Deployed as a Rich Internet Application (RIA)
- Graphical User Interface (GUI)
- High Quality Visualizations
- Leverage of Patterns

What is the Advanced Systems Engineering Lab (ASEL)?

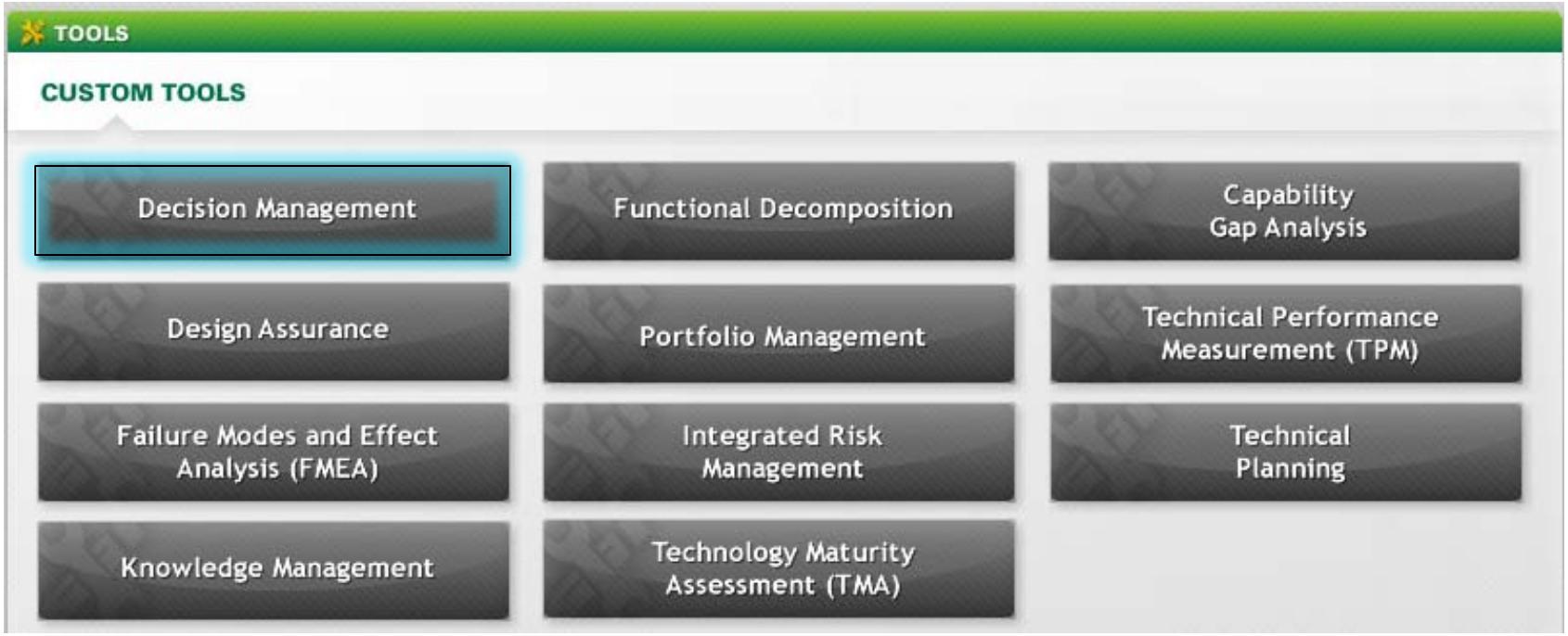
Advanced Systems Engineering Lab (ASEL)

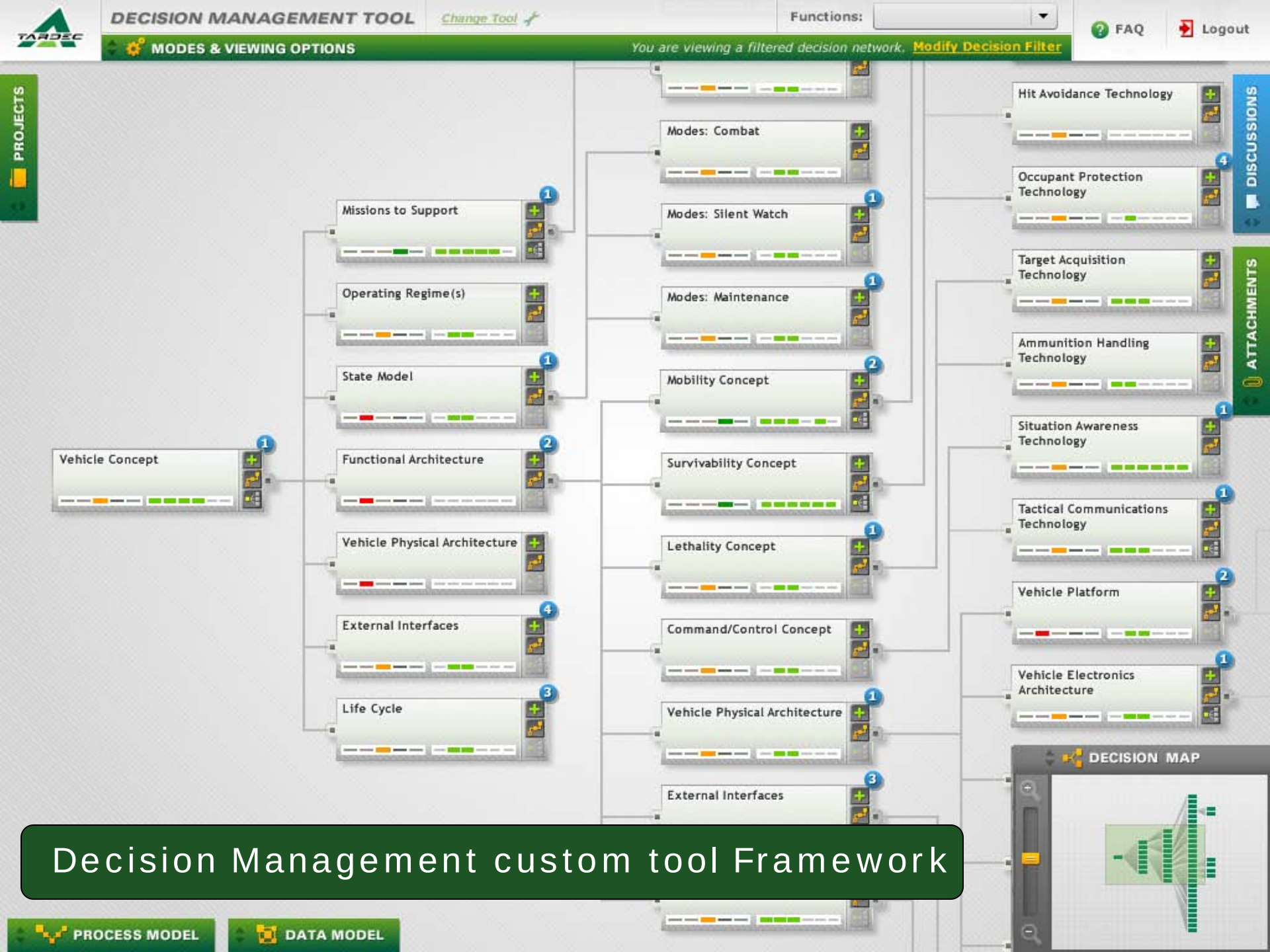
Is an integrated framework built on Method Centric Knowledge Creation, Visualization, Navigation and Management that enables continuous traceability, real time collaboration and pattern leverage



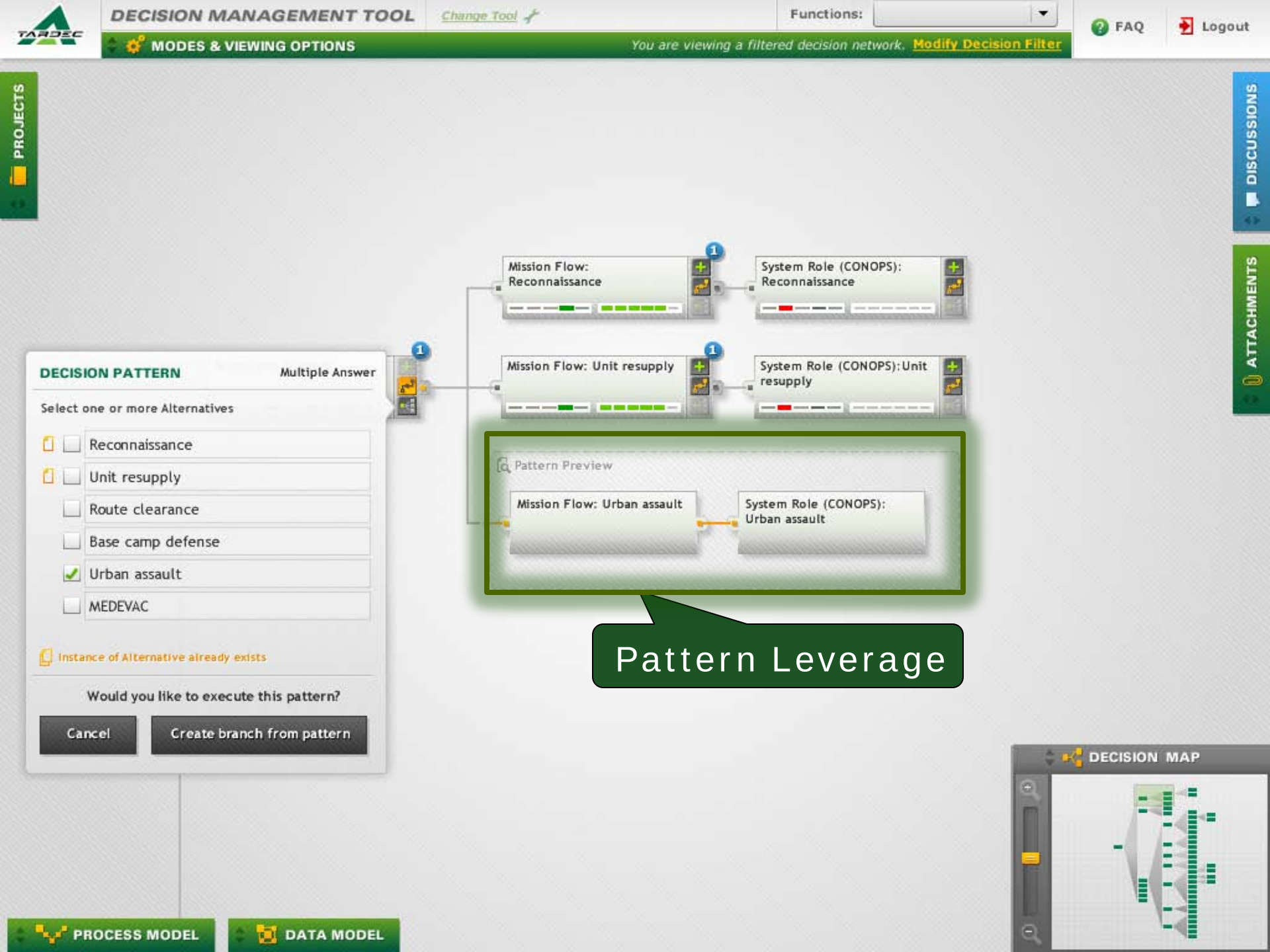
Snapshots of
Smart Custom Tool #1

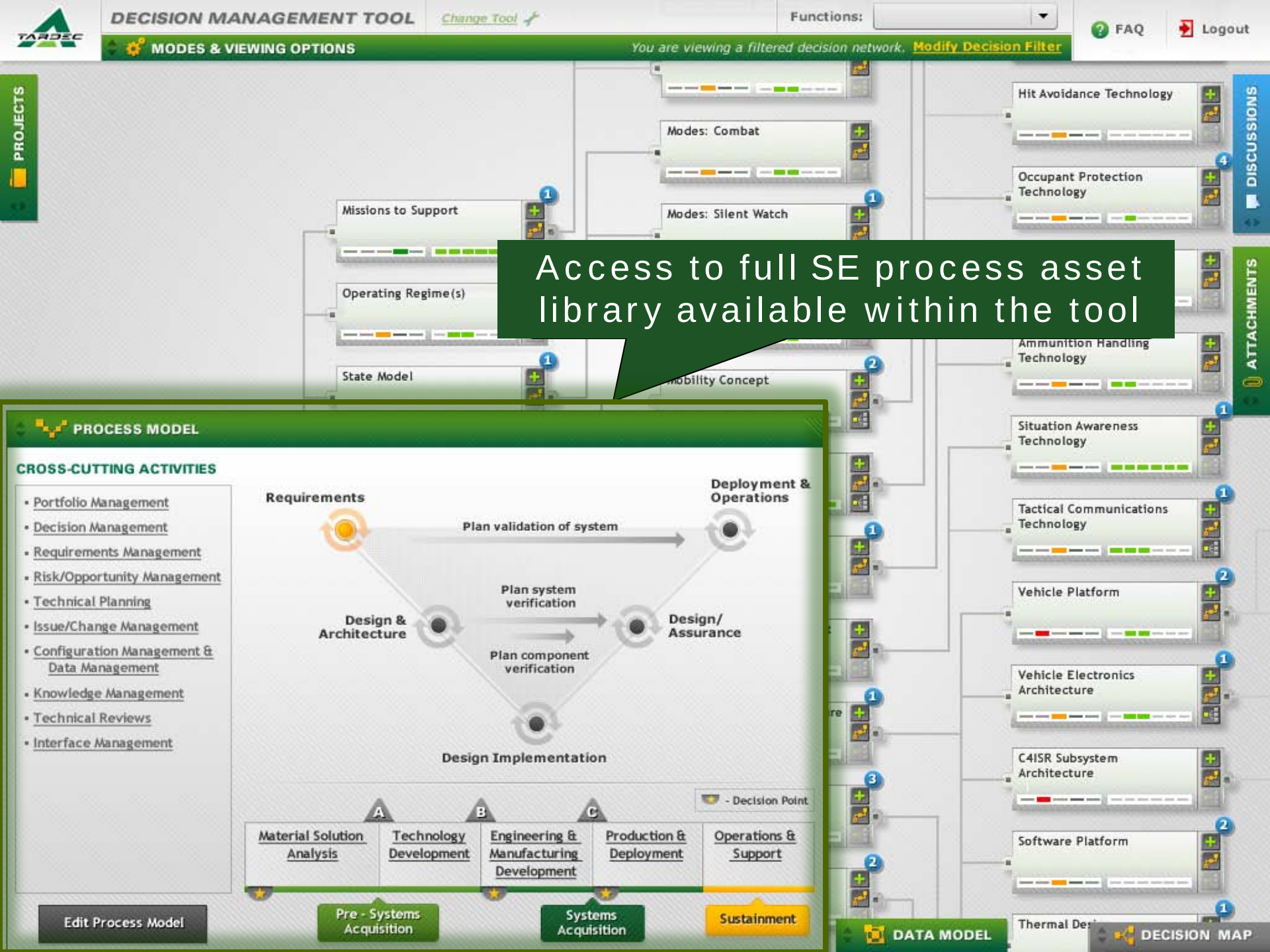
Decision Management

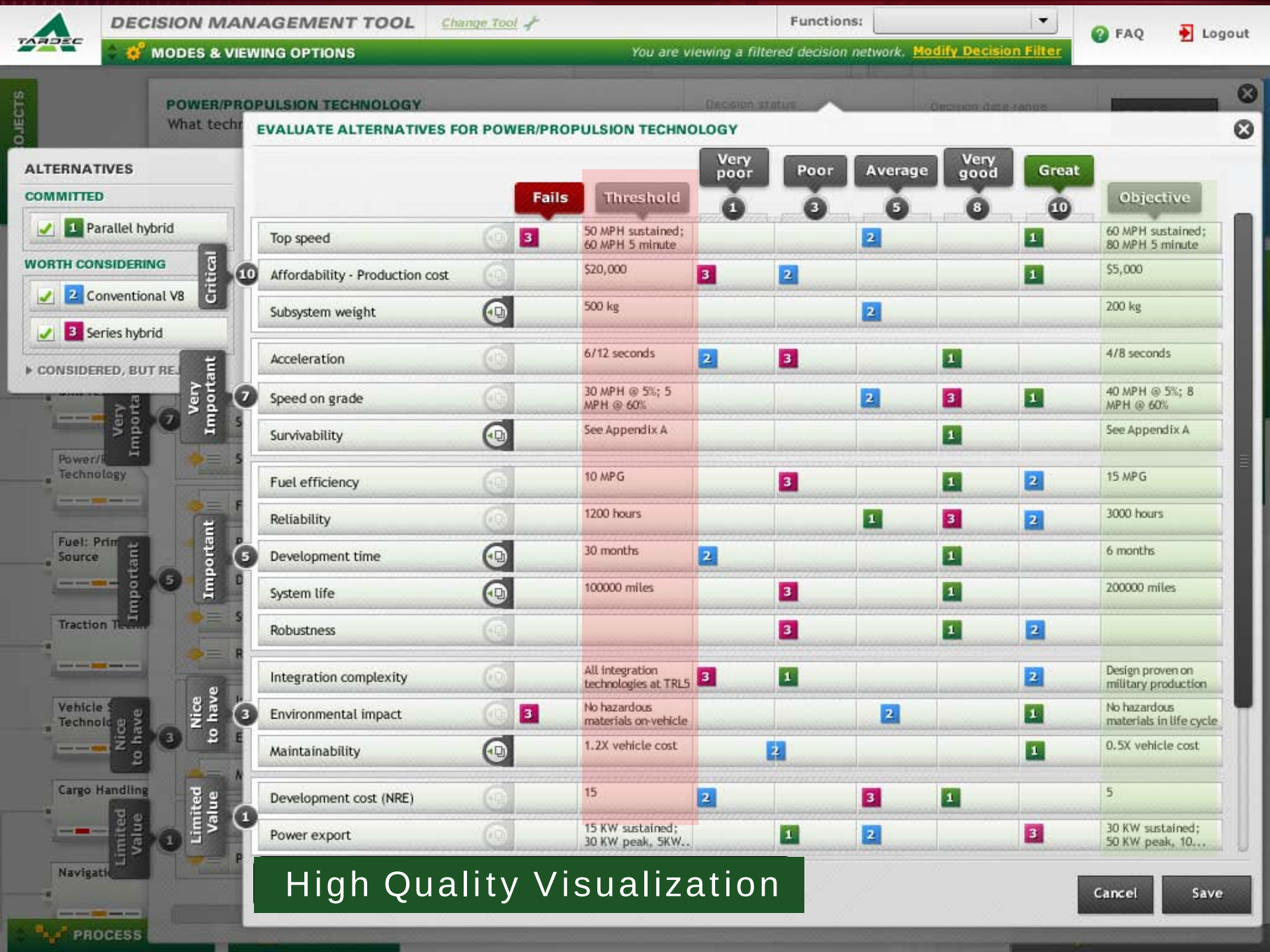




Decision Management custom tool Framework


DECISION MANAGEMENT TOOL
Change Tool
Functions:
FAQ
Logout
MODES & VIEWING OPTIONS
You are viewing a filtered decision network. Modify Decision Filter
PROJECTS
DISCUSSIONS
ATTACHMENTS
Mission Flow: Reconnaissance
System Role (CONOPS): Reconnaissance
Mission Flow: Unit resupply
System Role (CONOPS): Unit resupply
DECISION PATTERN
Multiple Answer
Select one or more Alternatives
Reconnaissance
Unit resupply
Route clearance
Base camp defense
Urban assault
MEDEVAC
Instance of Alternative already exists
Would you like to execute this pattern?
Cancel
Create branch from pattern
Pattern Preview
Mission Flow: Urban assault
System Role (CONOPS): Urban assault
Pattern Leverage
DECISION MAP
PROCESS MODEL
DATA MODEL


DECISION MANAGEMENT TOOL
Change Tool
Functions:
FAQ
Logout
MODES & VIEWING OPTIONS
You are viewing a filtered decision network. Modify Decision Filter
PROJECTS
DISCUSSIONS
ATTACHMENTS
Missions to Support
Operating Regime(s)
State Model
Modes: Combat
Modes: Silent Watch
Hit Avoidance Technology
Occupant Protection Technology
Ammunition Handling Technology
Situation Awareness Technology
Tactical Communications Technology
Vehicle Platform
Vehicle Electronics Architecture
C4ISR Subsystem Architecture
Software Platform
Access to full SE process asset library available within the tool
PROCESS MODEL
CROSS-CUTTING ACTIVITIES
Portfolio Management
Decision Management
Requirements Management
Risk/Opportunity Management
Technical Planning
Issue/Change Management
Configuration Management & Data Management
Knowledge Management
Technical Reviews
Interface Management
Requirements
Deployment & Operations
Plan validation of system
Plan system verification
Design & Architecture
Design/ Assurance
Plan component verification
Design Implementation
- Decision Point
A
B
C
Material Solution Analysis
Technology Development
Engineering & Manufacturing Development
Production & Deployment
Operations & Support
Edit Process Model
Pre - Systems Acquisition
Systems Acquisition
Sustainment
DATA MODEL
DECISION MAP


DECISION MANAGEMENT TOOL
Change Tool
Functions:
FAQ
Logout
MODES & VIEWING OPTIONS
You are viewing a filtered decision network. Modify Decision Filter
POWER/PROPULSION TECHNOLOGY
ALTERNATIVES
COMMITTED
1 Parallel hybrid
WORTH CONSIDERING
2 Conventional V8
3 Series hybrid
EVALUATE ALTERNATIVES FOR POWER/PROPULSION TECHNOLOGY
Fails
Threshold
Very poor
Poor
Average
Very good
Great
Objective
Critical
Very Important
Important
Nice to have
Limited Value
Top speed
Affordability - Production cost
Subsystem weight
Acceleration
Speed on grade
Survivability
Fuel efficiency
Reliability
Development time
System life
Robustness
Integration complexity
Environmental impact
Maintainability
Development cost (NRE)
Power export
High Quality Visualization
Cancel
Save
PROCESS

DECISION MANAGEMENT TOOL | Change Tool | Functions: | FAQ | Logout

MODES & VIEWING OPTIONS | You are viewing a filtered decision network. Modify Decision Filter

POWER/PROPULSION TECHNOLOGY

What techn

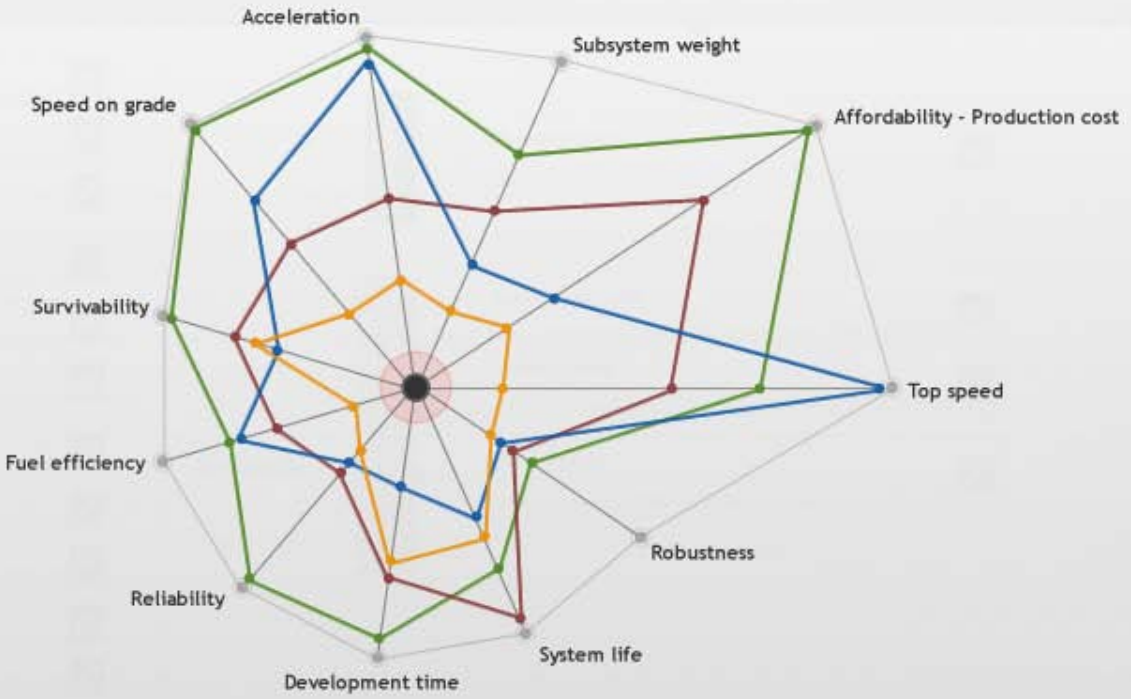
Decision status | Decision date range

COMPARE ALTERNATIVES FOR POWER/PROPULSION TECHNOLOGY

ALTERNATIVES

- Parallel hybrid (Rationale & Preference)
- Conventional V8 (Rationale & Preference)
- Series hybrid (Rationale & Preference)
- Dual diesels (Rationale & Preference)

▼ SPIDER CHART



▸ TORNADO CHARTS

Drag two alternatives from the list to this area to create a tornado chart

Drag two alternatives from the list to this area to create a tornado chart

Drag two alternatives from the list to this area to create a tornado chart

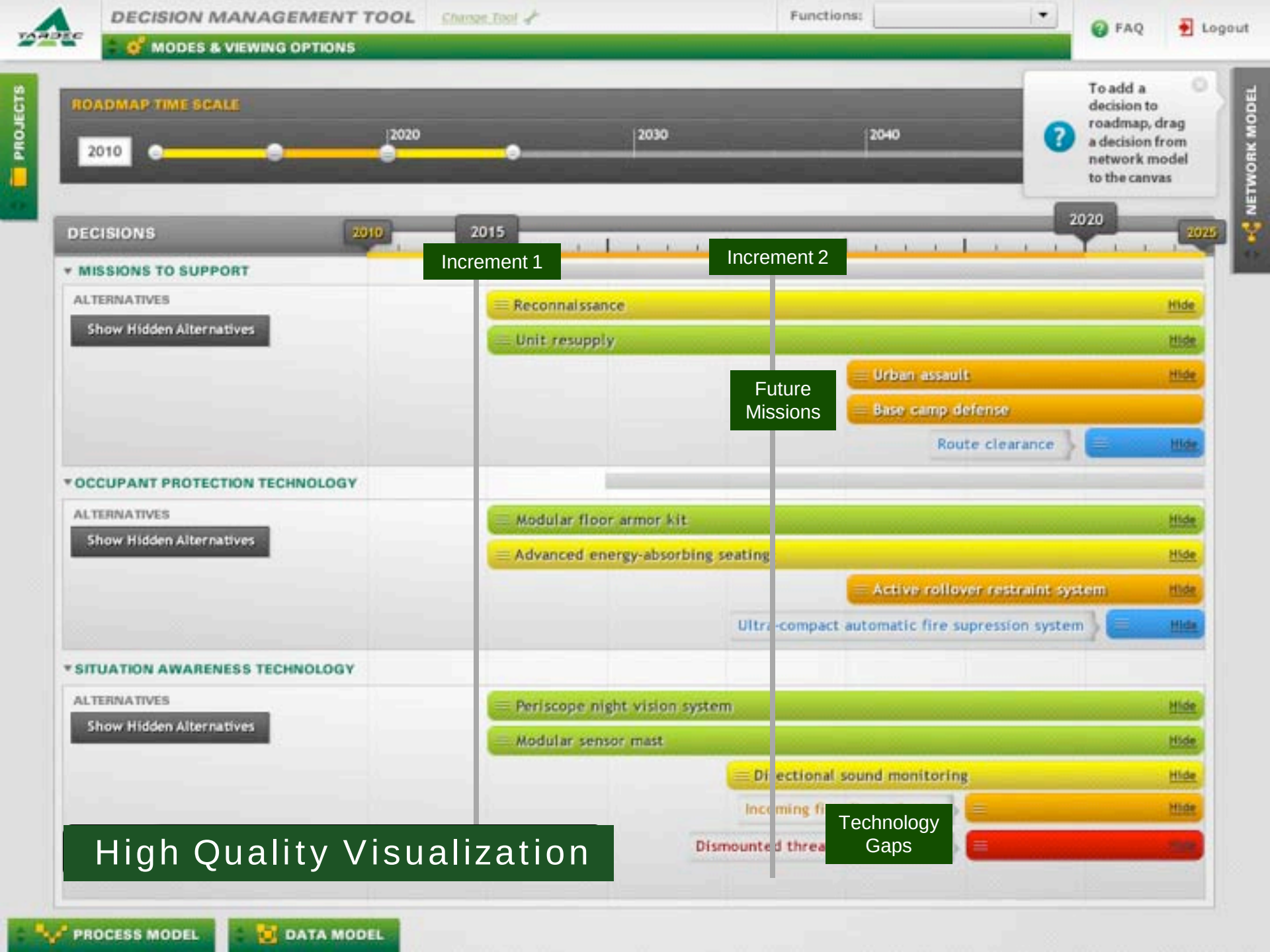
▸ TRADE OFFS

Important | Nice to have | Limited Value

PROCESS

High Quality Visualization


DECISION MANAGEMENT TOOL
Change Tool
Functions:
FAQ
Logout
MODES & VIEWING OPTIONS
You are viewing a filtered decision network. Modify Decision Filter
POWER/PROPULSION TECHNOLOGY
What techn
Decision status
Decision date range
COMPARE ALTERNATIVES FOR POWER/PROPULSION TECHNOLOGY
High Quality Visualization
ALTERNATIVES
Parallel hybrid
(Rationale & Preference)
Conventional V8
(Rationale & Preference)
Series hybrid
(Rationale & Preference)
Dual diesels
(Rationale & Preference)
SPIDER CHART
TRADE OFFS
CONVENTIONAL V8
PARALLEL HYBRID
Clear chart
Drag an alternatives from the list to this area to compare trade differential
Drag an alternatives from the list to this area to compare trade differential
TRADEOFFS
Sort by
Alternatives
Scoring Attitudes
View Residual Risk & Opportunity
Opp. 10%
Performance 60%
Risk 30%
PARALLEL HYBRID
(Rationale & Preference)
CONVENTIONAL V8
(Rationale & Preference)
SERIES HYBRID
(Rationale & Preference)
P
R
Matrix
O
Matrix
Important
Nice to have
Limited Value
Fuel: Prim
Source
Traction
Vehicle
Technol
Cargo Handling
Navigati
PROCESS


DECISION MANAGEMENT TOOL
Change Tool
Functions:
FAQ
Logout
MODES & VIEWING OPTIONS
PROJECTS
NETWORK MODEL
ROADMAP TIME SCALE
2010
2020
2030
2040
To add a decision to roadmap, drag a decision from network model to the canvas
DECISIONS
2010
2015
2020
2025
Increment 1
Increment 2
MISSIONS TO SUPPORT
ALTERNATIVES
Show Hidden Alternatives
Reconnaissance
Hide
Unit resupply
Hide
Urban assault
Hide
Base camp defense
Hide
Route clearance
Hide
Future Missions
OCCUPANT PROTECTION TECHNOLOGY
ALTERNATIVES
Show Hidden Alternatives
Modular floor armor kit
Hide
Advanced energy-absorbing seating
Hide
Active rollover restraint system
Hide
Ultra-compact automatic fire supression system
Hide
SITUATION AWARENESS TECHNOLOGY
ALTERNATIVES
Show Hidden Alternatives
Periscope night vision system
Hide
Modular sensor mast
Hide
Directional sound monitoring
Hide
Incoming fi
Hide
Dismounted threa
Technology Gaps
High Quality Visualization
PROCESS MODEL
DATA MODEL